

## Swift Observation of GRB 061217

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## 0 Revisions

The XRT astrometry is replaced by the new position corrected for the effect of the hot column. The new host candidate, its redshift, and corresponding  $E_{iso}$  are added. The paragraph about a nearby source classified as galaxy by the SuperCosmos is removed. In the deeper observations by the Magellan telescope this source has a stellar point spread function (Berger *et al.* *GCN Circ.* 5950).

## 1 Introduction

BAT triggered on GRB 061217 at 03:40:08.21 UT (Trigger 251634) (Barthelmy, *et al.*, *GCN Circ.* 5926). This was a 0.256 sec rate-trigger on a short hard burst with  $T_{90} = 0.212$  sec. Swift slewed to this burst immediately and XRT began follow-up observations at  $T + 67$  sec. At the moment of slew, UVOT was in safe mode. Our best position, extracted from the XRT full data and including correction for new hot pixels (Evans, *et al.* *GCN Circ.* 5947) is the XRT location  $RA(J2000) = 160.4129deg$  (10h41m39.1),  $Dec(J2000) = -21.1241deg$  ( $-21d07'26.9''$ ) with an error of 6.0 arcsec (90% confidence). This position is at  $\sim 0.8$  arcsec from the candidate host galaxy detected by the Magellan telescope (Berger *et al.*, *GCN Circ.* 5949 and *GCN Circ.* 5965). At this redshift,  $E_{iso}$  of this burst is  $8 \times 10^{49}$  ergs.

## 2 BAT Observation and Analysis

Using the data set from  $T - 10$  to  $T + 57$  sec, further analysis of BAT GRB 061217 has been performed by Swift team (Parsons, *et al.*, *GCN Circ.* 5930). The BAT ground-calculated position is  $RA(J2000) = 160.418deg$  (10h41m40.4s),  $Dec(J2000) = -21.148deg$  ( $-21d08'52.0''$ )  $\pm 2.1$  arcmin, (radius, systematic and statistical, 90% containment). The partial coding was 86% (the off-axis angle was 40 deg).

The masked-weighted light curves (Fig.1) starts at trigger time  $T - 0.356$  sec with a single rapid rise, and returns to background at about  $T + 0.644$  sec.  $T_{90}(15 - 350keV)$  is  $0.212 \pm 0.041$  sec (estimated error including systematics). There is no evidence for pre-trigger or post-trigger activity in the extended interval of  $T - 120$  to  $T + 180$  sec. The spectral lag for this burst is  $-7 \pm 9$  msec (25 - 50 keV to 100 - 350 keV) using 8-msec binning. This is consistent with zero lag for short hard bursts (Barthelmy *et al.* *GCN Circ.* 5931).

The time-averaged spectrum from  $T - 0.1$  to  $T + 0.3$  sec is best fitted by a simple power law model. This fit gives a photon index of  $0.96 \pm 0.28$ , ( $\chi^2 = 50.2$  for 57 d.o.f.). For this model the total fluence in the 15 - 150 keV band is  $(4.6 \pm 0.8) \times 10^{-8}$  ergs/cm<sup>2</sup> and the 1-sec peak flux measured from  $T - 0.40$  sec in the 15 - 150 keV band is  $1.3 \pm 0.2$  ph/cm<sup>2</sup>/sec. All the quoted errors are at the 90% confidence level.

### 3 XRT Observations and Analysis

Using the full XRT data set of GRB 061217 ( $\sim 7.3$  ksec in Photon Counting mode), the refined XRT position is  $\text{RA}(J2000) = 160.4129\text{deg}$  ( $10\text{h}41\text{m}39.10\text{s}$ ),  $\text{Dec}(J2000) = -21.1241\text{deg}$  ( $-21\text{d}07'26.9''$ )  $\pm 6.0$  arcsec (90% confidence, using the updated teldef file as described by Burrows *et al.*, *GCN Circ.* 5750) (Evans, *et al.*, *GCN Circ.* 5947). This replaces the first XRT astrometry reported in Evans, *et al.*, *GCN Circ.* 5947 and Ziaeeepour, *et al.* GCN-Report-21.1.

We found that data are affected by hot pixels and bright Earth contamination. Thus for this analysis we have ignored all data below 0.5 keV, which minimizes these problems. The X-ray afterglow is faint, and had an initial count rate of  $0.04$  ct/sec. It follows a power-law decay, with a slope of  $0.64^{+0.69}_{-0.61}$ . The faintness of this source and its proximity to the hot columns made the astrometry of this source quite complex.

The summed Photon Counting mode spectrum has very few counts, and was fitted using Cash statistics. We have modelled the spectrum with a Galactic absorption  $nH = 4.51 \times 10^{20} \text{ cm}^{-2}$  and a power law. The photon index is poorly constrained, but lies within the range of  $-0.402$  to  $4.698$  (90% confidence). We also tried adding an additional absorber, to model any extragalactic absorption, however this was very poorly constrained, with  $nH = 0 - 4 \times 10^{22} \text{ cm}^{-2}$ .

### 4 UVOT Observation and Analysis

At the time of trigger, UVOT was in safe mode - caused by a backward time jump in ICU. It began observing the field of GRB 061217 later at 05:02:06.9 UT about 4917 sec after the BAT trigger (Batholmy, *et al.*, *GCN Circ.* 5926). No new source was detected within the XRT error circle in the White (100 sec) and V (200 sec) finding exposures, or in the co-added images in any filter down to 3-sigma magnitude (M. de Pasquale *et al.*, *GCN Circ.* 5934). Upper limits are summarized in Table 1. These upper limits are not corrected for Galactic extinction  $E(B - V) = 0.045$ .

Filter	Start	Stop	Exposure	3-Sigma UL
White (finding)	4917	5017	100	19.2
V (finding)	5024	5223	200	19.2
White	4917	11602	1343	20.6
V	5024	17392	1278	20.3
B	5842	7474	393	20.2
U	5637	7269	342	19.8
UVW1	5433	7065	393	19.7
UVM2	5228	17725	717	20.4
UVW2	6252	13325	997	20.6

Table 1: Magnitude limits from UVOT observations

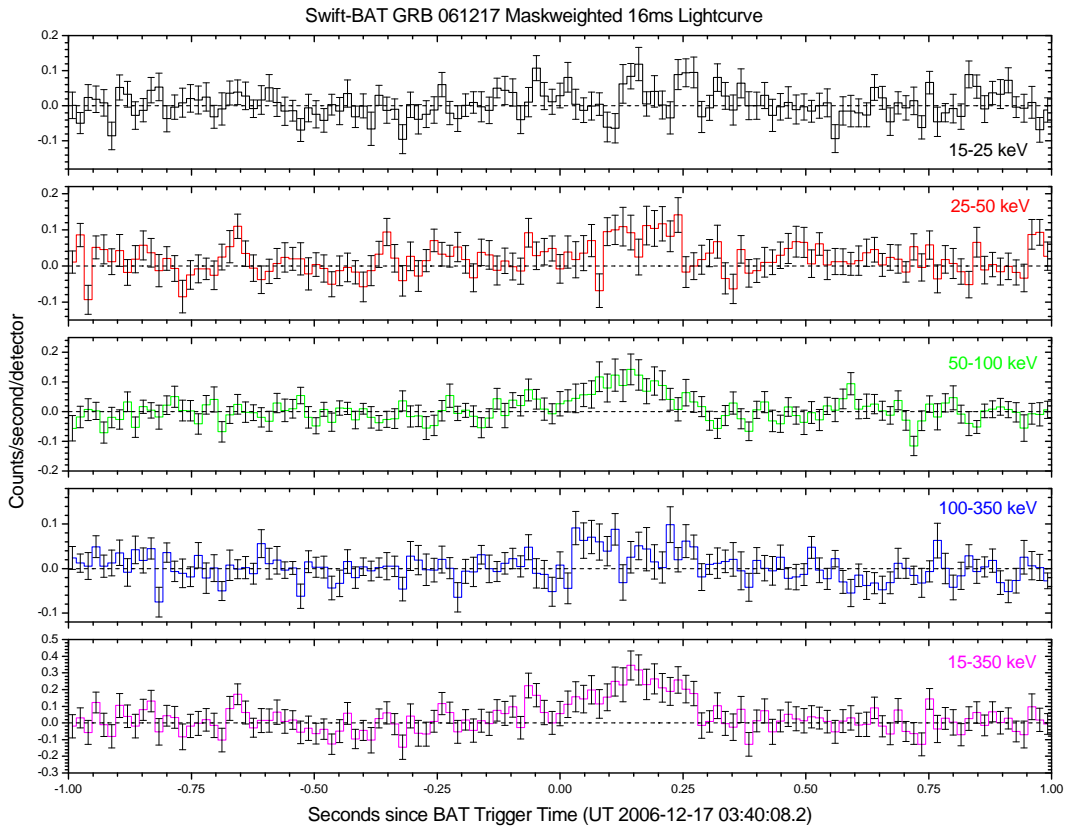


Figure 1: BAT Light curve. The mask-weighted light curve in the 4 individual plus total energy bands. The units are counts/sec/illuminated-detector (note illum-det =  $0.16\text{cm}^2$ ) and  $T_0$  is 03:40:08.21 UT.

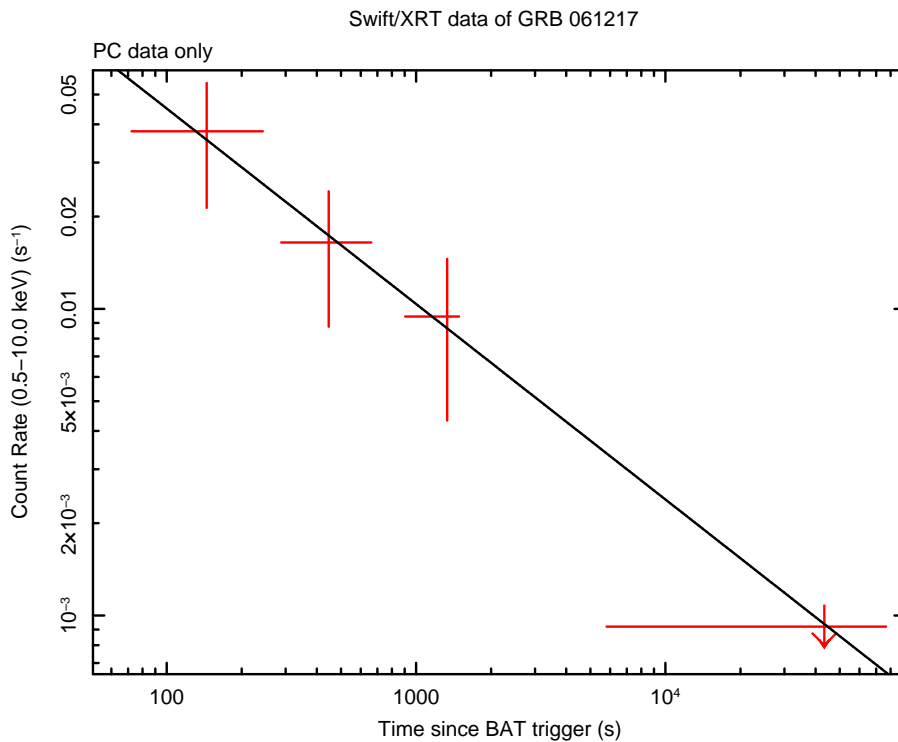


Figure 2: XRT Lightcurve. Counts/sec in the 0.3-10 keV band in Photon Counting (PC) mode. The approximate conversion is  $1\text{ count/sec} = \sim 5. \times 10^{-11}\text{ ergs/cm}^2/\text{sec}$ .